

WHAT IS CLAIMED IS:

- 1 1. A method for controlling an industrial process, the method
2 comprising;
3 outputting a plurality of parameters from a process for manufacture of a
4 substance;
5 using each of the plurality of parameters in a computer aided process, the
6 computer aided process comparing at least two of the plurality of parameters against a
7 training set of parameters, the training set of parameters being predetermined;
8 determining if the at least two of the plurality of parameters are within a
9 predetermined range of the training set of parameters; and
10 outputting a result based upon the determining step.
- 1 2. The method of claim 1 wherein the substance is selected from a
2 petroleum product, a chemical product, a food product, a health product, a cleaning
3 product, a biological product, and other fluid or objects.
- 1 3. The method of claim 1 wherein the plurality of parameters are
2 selected from an intrinsic element or an extrinsic element of the process.
- 1 4. The method of claim 1 wherein the using, determining, and
2 outputting are provided in a computer software program.
- 1 5. The method of claim 1 wherein the computer aided process
2 includes an algorithm selected from PCA, HCA, KNN CV KNN Prd, SIMCA CV,
3 SIMCA Prd, Canon Prd, SCREAM, and Fisher CV.
- 1 6. The method of claim 1 further comprising normalizing each of the
2 plurality of parameters before the using step.
- 1 7. The method of claim 1 further comprising adjusting a base line of
2 each of the plurality of parameters before the using step.
- 1 8. The method of claim 1 wherein the result is an affirmative response
2 or a negative response, where the response is displayed on a terminal.

1 9. The method of claim 1 wherein the computer aided process is
2 selected from a library comprising a plurality of processes for performing the comparing
3 step.

1 10. The method of claim 9 wherein the plurality of processes includes
2 at least a comparing process, a contrasting process, and a functional process.

1 11. A method for monitoring an industrial process for the manufacture
2 of materials, the method comprising:

3 inputting a plurality of process parameters from a process for manufacture
4 of a substance;

5 selecting one of a plurality of computer aided processes, each of the
6 computer aided processes being capable of determining an output based upon a training
7 set of the plurality of process parameters;

8 using each of the plurality of parameters in the selected computer aided
9 process, the selected computer aided process comparing at least two of the plurality of
10 process parameters against a training set of parameters;

11 determining if the at least two of the plurality of process parameters are
12 within a predetermined range of the training set of parameters; and

13 outputting a result based upon the determining step.

1 12. The method of claim 11 wherein the substance is selected from a
2 petroleum product, a chemical product, a food product, a health product, a cleaning
3 product, a biological product, and other fluid or objects.

1 13. The method of claim 11 wherein the plurality of process
2 parameters are selected from an intrinsic element or an extrinsic element of the process.

1 14. The method of claim 11 wherein the using, determining, and
2 outputting are provided in a computer software program.

1 15. The method of claim 11 wherein the computer aided process
2 includes an algorithm selected from PCA, HCA, KNN CV KNN Prd, SIMCA CV,
3 SIMCA Prd, Canon Prd, SCREAM, and Fisher CV.

1 16. The method of claim 11 further comprising normalizing each of
2 the plurality of parameters before the using step.

1 17. The method of claim 11 further comprising adjusting a base line of
2 each of the plurality of parameters before the using step.

1 18. The method of claim 11 wherein the result is an affirmative
2 response or a negative response, where the response is displayed on a terminal.

1 19. The method of claim 11 wherein the computer aided process is
2 selected from a library comprising a plurality of processes for performing the comparing
3 step.

1 20. The method of claim 19 wherein the plurality of processes includes
2 at least a comparing process, a contrasting process, and a functional process.

1 21. A method for identifying a mode of operation in an industrial
2 process, the method comprising:

3 running an industrial process, the industrial process being characterized by
4 a plurality of parameters at an in-process state of a substance or object being
5 manufactured, each of the parameters defining a characteristic of the substance or the
6 object in the in-process state;

7 converting each of the parameters into an electronic form;

8 inputting each of the plurality of parameters through a preprocessing
9 method to increase a signal to noise ratio of one or more of the plurality of parameters,
10 the preprocessing method being preselected based upon a training set of parameters that
11 improved the signal to noise ration of the one or more parameters;

12 processing the preprocessed parameters through a computer aided process
13 to form a descriptor from the preprocessed parameters, the computer aided process being
14 selected from a plurality of computer aided processes based upon a training set of
15 parameters;

16 determining if the descriptor is within a selected class from a plurality of
17 classes; and

18 outputting a result based upon the determining step.

1 22. A method for determining an acceptability of a process, the method
2 comprising:
3 identifying a plurality of process parameters from a process for
4 manufacture of a substance;
5 using one of the selected computer aided processes out of a plurality of
6 computer aided processes, the selected computer aided process being derived from a
7 training set of the plurality of process parameters;
8 determining an acceptability of the process using each of the plurality of
9 parameters in the selected computer aided process, the selected computer aided process
10 comparing at least two of the plurality of process parameters against a training set of
11 parameters; and
12 outputting a result based upon the acceptability of the process.

1 23. A method for monitoring a process, the method comprising:
2 storing a first model in a memory;
3 acquiring data from a process;
4 applying the first model to the data to identify a first predicted descriptor
5 characteristic of a state of the process; and
6 consulting a first knowledge based system to provide an output based upon
7 the first predicted descriptor.

1 24. The method of claim 23 wherein the model is constructed from a
2 mathematical equation describing a physical law.

1 25. The method of claim 23 further comprising preprocessing the data
2 prior to applying the model.

1 26. The method of claim 23 wherein the output is communicated to
2 control the process by adjusting an operational parameter of the process.

1 27. The method of claim 23 wherein the output is communicated to a
2 human operator to permit monitoring of the process.

1 28. The method of claim 23 wherein the output is resident on a server
2 and accessible to a user through a browser software program.

1 29. The method of claim 28 wherein the input is acquired from the
2 process over a network of computers

1 30. The method of claim 23 wherein the input is acquired from the
2 process over a network of computers..

1 31. The method of claim 23 wherein the output is communicated over
2 a network to an associated system, the associated system including at least one of a legacy
3 system, an e-enterprise system, and a desktop application.

1 32. The method of claim 23 wherein the first knowledge based system
2 is an expert system.

1 33. The method of claim 23 further comprising:
2 acquiring initial data from a source at a first time;
3 converting the initial data into electronic form;
4 loading the initial data into memory;
5 retrieving the initial data from memory;
6 acquiring subsequent data from the source at a second time;
7 assigning a first descriptor to the initial data and a second descriptor to the
8 subsequent data;
9 constructing the model based upon the initial data, the subsequent data, the
10 first descriptor, and the second descriptor; and
11 storing the model in memory.

1 34. The method of claim 33 wherein the model is constructed from one
2 of a univariate statistical technique, a multivariate statistical technique, a neural-based
3 approach, and a time series analysis.

1 35. The method of claim 33 wherein the model is constructed from one
2 of a group of different algorithms stored in a library.

1 36. The method of claim 33 wherein the source is in communication
2 with the process, the initial data and the subsequent data reflecting prior operation of the
3 process.

1 37. The method of claim 33 wherein the source is in communication
2 with a second process similar to the process, the initial data and the subsequent data
3 reflecting operation of the second process.

1 38. The method of claim 33 further comprising:
2 constructing a second model;
3 storing the second model in memory;
4 applying the second model to the process data to identify a second
5 predicted descriptor characteristic of the process data; and
6 consulting the first knowledge based system to produce the output based
7 upon the first predicted descriptor and the second predicted descriptor.

1 39. The method of claim 38 wherein the second model is constructed
2 based upon the initial data, the subsequent data, the first descriptor, and the second
3 descriptor, such that comparison of the first descriptor and the second descriptor
4 represents a cross-validation.

1 40. The method of claim 38 wherein the second model is constructed
2 from operation of a second process similar to the process, such that comparison of the
3 first descriptor to the second descriptor represents an external validation..

1 41. The method of claim 38 wherein the knowledge based system is an
2 expert system.

1 42. The method of claim 38 wherein a difference between the first
2 predicted descriptor and the second predicted descriptor is resolved by a second expert
3 system.

1 43. The method claim 23 further comprising receiving key preliminary
2 information and communicating the key preliminary information downstream to the first
3 model, such that the first predicted descriptor reflects the key preliminary information.